

ber of rib-like irregular ridges". *P. pennsylvanicus* Pils. (Proc. Acad. Nat. Sci. Phil., p. 22, 1894) is described as being "smaller and less distinctly marked than *P. carolinensis*" and "having the jaw strongly ribbed", a description which could not be applied to *P. rushi*.

CLIMATIC CONDITIONS AS INDICATED BY LAND SHELLS ON THE
ISLAND OF OAHU.

BY J. J. GOUVEIA.¹

Since the early part of 1913 the writer and his brother A. Gouveia have been engaged in making a collection of Hawaiian land shells, both ground and tree. We have accumulated specimens of shells from nearly all valleys and ridges on the island of Oahu. We have complete data as to the exact locality and habits, so it can be seen that the writer has a good proof, from his series, of Gulick's theories of segregation or isolation. This idea has been written and followed out by many other collectors and students until it is well known in the scientific world. One of the best examples of this is seen in Dr. Cooke's paper on *Achatinella multizona*.

DISTRIBUTION OF *Achatinella cestus* FROM MANOA-PALOLO RIDGE TO WAILUPE-NIU RIDGE.—*Achatinella cestus* (Newcomb) is found mostly on lehua or one of its related plants having a rather large dark green and glossy leaf, on Ieie, Opiko and Lantana, and nearly always under leaves, with the exception of the Wailupe-Niu locality where they are found mostly on Lantana stems. They are nearly always found sealed. The only time they are found extended is when they are disturbed by wind or rain or accidentally brushed off, so they must be nocturnal as Dr. Cooke surmises (1).

They are very variable in color from white to very dark brown. They are lighter on the western part of the range and become darker towards the eastern part. The greater part of these shells have a white border band (2).

¹Contribution from the Gulick Natural History Club.

The writer has specimens from five different localities. Four of these localities are on ridges and the other in a valley. First locality, Manoa-Palolo Ridge: Fossil specimens in collection as catalogued, Cat. No. 487, four sinistral and No. 492 three sinistral, making a total of seven sinistral specimens.

Second locality, Palolo-Waialae Nui ridge: Fossil and living specimens, Catalogue No. 61 nine dextral, No. 382 two dextral and two dextral fossil specimens not catalogued. Total, eleven dextral live specimens and two dextral fossil specimens.

Third locality, Waialae-Nui valley: Catalogue No. 38 seven dextral specimens, No. 383 one dextral specimen, No. 39 seven dextral specimens. Total, fifteen dextral specimens.

Fourth locality, Waialae Iki-Wailupe ridge: Catalogue No. 28, fifty-two sinistral specimens.

Fifth locality, Wailupe-Niu ridge: Catalogue No. 14, two hundred and twenty-two sinistral specimens.

Summary.

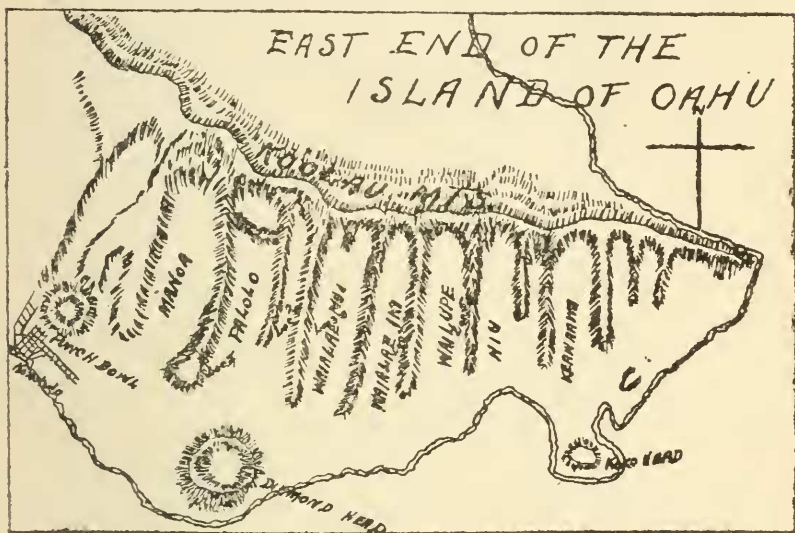
	Fossil.		Live.	
	Dextral.	Sinistral.	Dextral.	Sinistral.
1st locality . .	—	7	—	—
2nd " . .	2	—	11	—
3rd " . .	—	—	15	—
4th " . .	—	—	52	—
5th " . .	—	—	—	222
	<hr/>	<hr/>	<hr/>	<hr/>
Totals. . .	2	7	78	222

Thus it can be seen from the above given data the specimens increase in number from west to east, the first ridge having no live specimens and the last having the most. What does this signify? Does not this signify that since Diamond Head and Punchbowl came into eruption, climatic conditions have changed which resulted in the elimination of *cestus* from the neighborhood of the two now extinct volcanoes?

Now, in relation to the fossils found on location one, this is the nearest locality to Diamond Head; the second locality a little further away; the third still further; and the fourth and

fifth, the furthest of all, say about seven miles comparing with about two and one-half miles, locality one.

The fossils were found lower than the live specimens on the ridges, and as we go east the live specimens are found higher up on the ridges or further away from the lower limits as indicated by the fossils.



In 1916 while the Honolulu Water Works were digging a ditch for a pipe line, fossils of *Achatinella montaguei* and *buddi* were found by A. Gouveia buried about four feet deep in Manoa valley near Manoa tennis court. The *montaguei* is now extinct and the *buddi* nearly so in other localities. They are however extinct in the above given locality. These shells thrived very low once, and owing to the climatic changes the forest has disappeared, thus explaining the present distribution.

The strongest evidence yet is indicated by fossil ground shells, catalogue numbers 932 to 942 inclusive, *Leptachatina oryza* and a few other unnamed varieties which were collected on the western slope of Diamond Head, also catalogue Nos. 859 to 869 inclusive. *Amastra transversalis* also *Endodonta* and *Leptachatina*, Nos. 972 to 975 inclusive, collected on the town side of

Punchbowl. These shells are frequent in occurrence and now extinct. Dr. C. H. Hitchcock gives a very good account of the geological occurrence or position of these shells on Diamond Head and Punchbowl (3).

We have also collected *Amastra* fossils from Kahuku, Moku-leia and Kwaihapai.

The cause of recent disappearance is the destruction of the forest, collecting by people, and ravages of cattle and goats. An example of this is found on Olomana where Dr. Gulick collected in or about 1850. In the fifties this peak was covered with forest which has disappeared. *Achatinella phæozona* was found on Olomana where it is not now found owing to the disappearance of the forest.

Papers referred to.

1. Cooke, C. Montague.—Distribution and Variation of *Achatinella multizonata* from Nuuanu Valley. Occasional Papers, Bernice Pauahi Bishop Museum, Vol. II, No. 1-5, pp. 65-76.

2. Thwing, E. W.—Occasional Papers of the Bernice Pauahi Bishop Museum of Polynesian Ethnology and Natural History, Vol. III, No. 1, 1907, pp. 13. Original Descriptions of *Achatinella*.

3. Hitchcock, C. H., and Dall, W. H.—Geology of Oahu, Bulletin of the Geological Society of America, Vol. II, pp. 15 to 60, February, 1900. Notes of Fossil Land Shells on pp. 54-55.

A NEW CYPRAEA FROM HAWAII.

BY J. M. OSTERGAARD.¹

CYPRAEA PACIFICA, n. sp. Plate 2, lower five figs.

Whitish to cream color, richly ornamented with chestnut-brown spots, evenly sprinkled over the dorsal surface; base, aperture and teeth, white; resembles *C. cernica* Sowb. in form, having in common with that species elevated and pitted mar-

¹ Contribution from the Gulick Nat. Hist. Club.